



Title

Heart rate, heart rate variability, and **blood pressure** during perioperative stressor events in abdominal surgery.

Author

Schubert A; Palazzolo J A; Brum J M; Ribeiro M P; Tan M

Organization

Department of General Anesthesiology, Cleveland Clinic Foundation, OH 44195, USA.

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Abstract

STUDY OBJECTIVE: To define the behavior of power spectral heart rate variability (PSHR) during potentially stressful events in the perioperative period, and relate it to changes in **blood pressure** (BP) and heart rate (HR). **DESIGN:** Longitudinal clinical study. **SETTING:** Operating room and recovery suites of a large tertiary care referral center. **PATIENTS:** 26 ASA physical status I, II, and III patients undergoing elective abdominal surgery. **INTERVENTIONS:** Anesthesia was induced with thiopental sodium and fentanyl, and maintained with isoflurane/nitrous oxide (N₂O)/**relaxant** or enflurane/N₂O/**relaxant**. The trachea was intubated and intraabdominal surgery was performed. **MEASUREMENTS AND MAIN RESULTS:** Observations consisted of HR, noninvasive **blood pressure**, and PSHR. They were made before and after induction of anesthesia, tracheal intubation, and surgical incision, and during maximal surgical stimulation and skin closure. HR and mean arterial pressure (MAP) maxima were also recorded for one hour before and after emergence from anesthesia. PSHR was obtained using a special algorithm and data acquisition system for real time **spectral analysis** of the instantaneous HR versus time function. The HR power spectrum parameters analyzed were low-frequency (LFA; powerband = 0.04 to 0.10 Hz), respiratory-induced frequency (RFA; powerband = respiratory frequency \pm 0.06 Hz), and the ratio of LFA to RFA. With induction of anesthesia, only RFA power decreased significantly. LFA power reduction became significant only after intubation and continued so until after incision. Immediately after induction, the decline in RFA power (vs. preinduction) was more pronounced when compared with the decline in LFA power (76% vs. 34%; $p = 0.01$). Hence, the ratio LFA/RFA increased significantly after induction of anesthesia. It was significantly higher than at postintubation, preincision, or skin closure. A significant elevation in LFA, LFA/RFA ratio, and BP occurred with maximal abdominal surgical stimulation. Only preinduction LFA, RFA, and LFA/RFA ratio were predictive of MAP changes with induction of anesthesia ($p = 0.006$). In 8 of the 15 patients who had MAP changes of at least 10 mmHg with induction, PSHR indices correctly predicted a change of this magnitude. Late intraoperative HR maxima were positively correlated with the change in HR and incision ($r^2 = 0.58$; $p < 0.01$). The change in BP with incision was positively correlated with early postoperative HR maxima ($r^2 = 0.60$; $p < 0.01$). **CONCLUSIONS:** On anesthetic induction, preoperative, but not intraoperative, spectral indices were predictive of BP changes. Power **spectral analysis** of HR may provide information about the autonomic state that is not evident from BP

or HR. The HR power spectrum, in particular, indicated a striking autonomic imbalance immediately after the induction of anesthesia despite stable HR and BP. LFA and LFA/RFA ratio appeared to track sympathetic autonomic activation during abdominal surgical stimulation, but not during other perioperative stressor events.

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Title

STRESS AND RELAXATION EVALUATION BY QUESTIONNAIRE SALIVARY CHANGES AND PHYSIOLOGICAL RESPONSES IN A TRAINED MEDITATOR.

Author

MORSE D R [Reprint author]; DONALD M; SCHACTERLE G R; MARTIN J S; DIPONZIANO J; ZAYDENBERG M; ESPOSITO J V; CHOD S D; FURST M L M

Organization

DEP ENDODONTOLOGY, TEMPLE UNIV SCH DENTISTRY, 3223 NORTH BROAD ST, PHILADELPHIA, PA 19140, USA

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Title

Emotions and respiratory patterns: Review and critical analysis.

Author

Boiten F.A.; Frijda N.H.; Wientjes C.J.E.

Organization

Department Experimental Psychology, University of Amsterdam, Roetersstraat 15, 1018 WB Amsterdam, Netherlands

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Abstract

The literature on emotions and respiration is reviewed. After the early years of experimental psychology, attention to their relationship has been sparse, presumably due to difficulties in adequate measurement of respiration. The available data suggest nevertheless that respiration patterns reflect the general dimensions of emotional response that are linked to response requirements of the emotional situations. It is suggested that the major dimensions are those of calm-excitement, **relaxation**-tenseness, and active versus passive coping. Research on the emotion-respiration relationships has been largely restricted to the correlates of respiration **rate**, amplitude, and volume. Finer distinctions than those indicated may well be possible if a wider range of parameters, such as the form of the **respiratory** cycle, is included in the investigation.

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